

# Acupuncture and Hypnosis for Pain Management in a Child with Acute Lymphoblastic Leukemia: A Single-Case Experimental Design

Bijan Pirnia<sup>\*,\*\*\*</sup>, PhD, Parastoo Malekanmehr<sup>\*\*\*</sup>, PhD, Paria Sadeghi<sup>\*\*\*\*</sup>, MSc, Kambiz Pirnia<sup>\*\*\*\*\*</sup>, MD, Alireza Zahiroddin<sup>\*\*\*\*\*</sup>, MD

*\*Behavioral Sciences Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran*

*\*\*Bijan Center for Substance Abuse Treatment, Tehran, Iran*

*\*\*\*Department of Psychology, Faculty of Psychology, Tonekabon Branch, Islamic Azad University, Tonekabon, Iran*

*\*\*\*\*Department of Psychology, Faculty of Psychology, Tehran Science and Research Branch, Islamic Azad University, Tehran, Iran*

*\*\*\*\*\*Cardiology Fellowship, Technical Assistant in Bijan Center for Substance Abuse Treatment, Tehran, Iran*

*\*\*\*\*\*Department of Psychiatry, Behavioral Sciences Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran*

Please cite this article as: Pirnia B, Malekanmehr P, Sadeghi P, Pirnia K, Zahiroddin A. Acupuncture or hypnosis for pain management in a child with acute lymphoblastic leukemia: A single-case experimental design. Middle East J Cancer. 2022;13(1):177-82. doi: 10.30476/mejc.2021.85868.1310.

## Abstract

Burn and wound care process for children is very painful and distressing. Hypnosis is used as a technique to reduce pain and anxiety caused by burns in adults. Acupuncture is also applied to reduce pain and improve psychological indices. However, the effectiveness of the two treatments in children has not been compared so far. In a single-case experimental design, from October 2015 to June 2016, an eight-year-old child with acute lymphoblastic leukemia and a severe left-hand burn was selected through the purposely sampling method and was treated in the form of a reverse A1B1A2B2 design in four time intervals, including sham, acupuncture, natural hypnosis, and clinical hypnosis, and was evaluated over a 24-week period. Data were analyzed via generalized estimation equation (GEE) and Repeated Measures Correlation (rmcorr) SPSS version 22. The primary outcomes showed that hypnosis had a significant effect on pain and anxiety (all  $P$  values  $< 0.05$ ) and did not have any effect on the salivary cortisol level ( $P = 0.93$ ). Additionally, acupuncture had a significant effect on reducing the pain, anxiety, and cortisol levels (all  $P$  values  $< 0.05$ ). Secondary outcomes revealed a significant positive correlation between pain, anxiety, and cortisol (all  $P$  values  $< 0.01$ ). The results of this study, consistent with the research background, indicated the effectiveness of each treatment on specific physical and psychological indices. These results can be considered in designing appropriate therapeutic programs although the explanation of the gap between the effectiveness of the two treatments requires further studies.

### Corresponding Author:

Bijan Pirnia, PhD  
Behavioral Sciences Research  
Center, Shahid Beheshti  
University of Medical Sciences,  
Tehran, Iran  
Tel: +98 21-22081450  
Email: bijanpirnia@yahoo.com



**Keywords:** Hypnosis, Acupuncture, Burn, Cancer, Pain

Received: March 26, 2020; Accepted: November 30, 2021

## Introduction

Acute lymphoblastic leukemia (ALL) is the most prevalent type of cancer in children. In children with ALL, the B cells are more likely to become infected. Burning due to inappropriate use of household equipment is a problem in the pediatric population. Among the various causes of burnings, burns with hot liquids are among the most prevalent causes of injury in children.<sup>1</sup>

Second degree burns, called burns with relative thickness, are slightly larger than first-degree burns, as they affect the outer layer of the skin (the epidermis) and part of its underlying layer (inside the skin). These burns cause blisters, severe pain, redness, and swelling. Its wounds and blisters open, causing a colored burn between the pink and the red with a damp appearance. Pain is one of the common problems in burn patients. Burn and wound care in children can be a very painful and distressing procedure.<sup>2</sup> Pain relief in burn patients is of great significance.

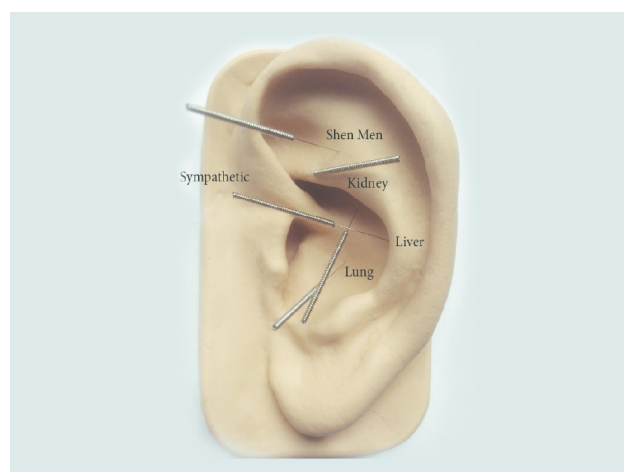
Today, the use of complementary or alternative medicine, along with drug interventions, has a growing degree of acceptance among therapists.<sup>3</sup> Acupuncture is a therapeutic approach utilized throughout the world for almost 2000 years. Auricular acupuncture is a specific type of acupuncture first described in 2500 BC and acupuncture is currently being implemented by the National Acupuncture Detoxification Association (NADA) protocol at 250 hospitals in the United Kingdom and the United States. NADA is a functional manual for auricular acupuncture protocol that is widely employed in the United States.<sup>4</sup> The NADA protocol is an evidence-based approach focused on the stimulation of three to five specific points in the ear used individually and in a group in routine medical and psychosocial care. This approach, in addition to positive therapeutic outcomes, is affordable and cost-effective along with the least side-effects. Studies have shown that the use of acupuncture has been effective in reducing pain in chronic patients.<sup>5</sup> The findings of the study by Pirnia et al.<sup>6</sup> shed light on the effectiveness of acupuncture on the reduction of musculoskeletal pain. In contrast to the results of Pirnia et al.,<sup>7</sup> it

was proved that the use of acupuncture did not have a significant effect on pain relief in patients with skeletal pain.

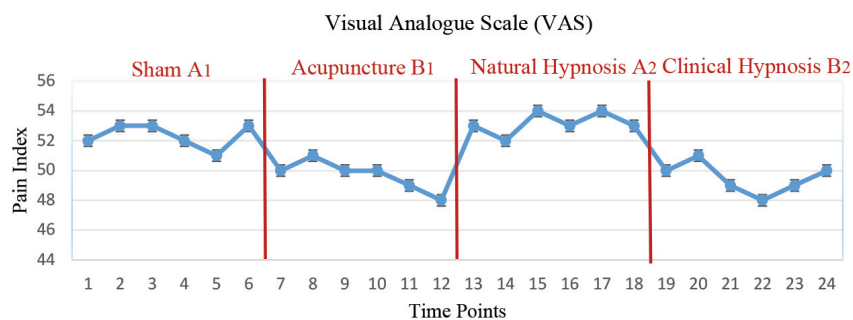
On the other hand, evidence from clinical trials suggests that psychological interventions, such as hypnosis should be applied as a complement to medication in patients with burns.<sup>8</sup> The results of a meta-analysis by Provençal et al.<sup>8</sup> demonstrated that the use of hypnosis has a significant effect on pain relief and anxiety in burn patients. In a study by Jafarzadeh et al.,<sup>3</sup> it was found that the two sessions of hypnosis had a significant effect on the reduction of pain and anxiety. On the contrary, the findings of the study by Chester et al.<sup>2</sup> revealed the ineffectiveness of hypnosis on reducing pain in children with burns.

On the other hand, stress stimulates the secretion of corticotropin from the hypothalamus, resulting in cortisol secretion. The research background supports the effectiveness of acupuncture on the reduction of the cortisol level,<sup>3</sup> on which several studies have been conducted. Acupuncture, by adjusting the activity of HPA axis has been associated with improving adrenocorticotrophic hormone function and cortisol secretion.

According to the contradictory findings on the effectiveness of the two treatments on the pain, anxiety, and cortisol levels and the lack of research background in comparing the two treatments and the importance of biological markers, such as cortisol, in the pathophysiological understanding



**Figure 1.** Acupuncture points are depicted according to the NADA protocol.



**Figure 2.** Distribution of pain scores is presented during the 24 evaluation steps.

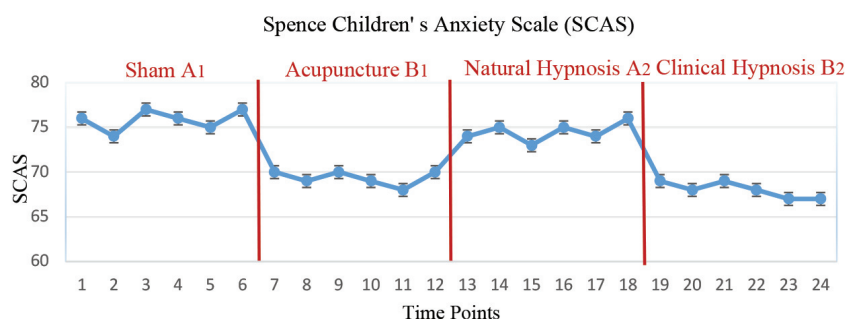
of psychiatric diseases, this study was conducted. The objective of present work was to compare the effectiveness of the two acupuncture treatments and clinical hypnosis on pain index, anxiety, and salivary cortisol levels in a child with ALL and hand burns.

### Case Presentation

The present study was a single-case experimental design study (TCTR20190208002). Data were collected from October 2015 to June 2016. The ethics committee of Shahid Beheshti University of Medical Sciences approved this study (Ethics code: IR.SBMU.RETECH.REC.1397.347). An eight-year-old child with acute burns on the left-hand side was selected through the purposely sampling method and placed in a reverse A1B1A2B2 design with a multiple baselines. During the 24 weeks, four procedures, namely sham, acupuncture, hypnosis, and clinical hypnosis, were performed for six weeks and evaluations were carried out in the form of repeated measures.

Auricular acupuncture was performed once a week for six weeks (six sessions) and the duration of each treatment session was 30-45 minutes before lunch. The participant sat in a quiet room and in a comfortable position on the chair. During the session, five ear points called Sympathetic, Shen Men, Kidney, Liver, and Lung were interfered (Figure 1). The sham group received stimuli at a distance of two millimeters from the original position.<sup>16</sup> Acupuncture was carried out in both ears using one-use stainless steel needles (0.25 + 13 mm) with a depth of 2-3 mm, via hand stimulation by a trained physician and an acupuncturist with a five-year treatment history (the second author, K. P).

Before the intervention, Stanford Hypnotic Clinical Scale (SHCS) was employed to assess the hypnosis of the child. This scale comprises five items, including moving hands together, a dream, age regression, a posthypnotic suggestion, and posthypnotic amnesia. At the stage of hypnotic intervention, four eye stabilization techniques, progressive muscle relaxation (PMR) techniques,



**Figure 3.** Distribution of anxiety scores is presented during the 24 evaluation steps.

Chiasson induction technique, and hand flying were used to initiate hypnosis and induction. Imagination, dissociation, and PMR techniques were also applied for deepening the trance. The neutral hypnosis process as a placebo included general and non-therapeutic suggestions.<sup>3</sup>

Cortisol was sampled randomly twice a week. Salivary cortisol was collected by use of Salvi Test. The patient put his saliva into a small straw into tubes labeled with time and date. The subject was trained in eating food, brushing teeth, or drinking (except water) at the hours before the testing session. Rapid changes in the morning cortisol level were winsurized by identifying cortisol concentrations more than four standard deviations from the mean. The cortisol samples were stored at  $-20^{\circ}\text{C}$  or lower and centrifuged at 3000 rpm for 15 minutes and tested using highly sensitive enzyme immunoassay kit. Lost samples were replaced with mean values. Herein, a structured clinical interview (SCID-5), SHCS, Spence children's anxiety scale (SCAS), visual analogue scale (VAS), and Enzyme-Linked Immunosorbent Assay (ELISA) were applied. Data were analyzed via generalized estimation equation and correlation with repeated measures in SPSS software 22 and the significance level was considered as 0.05. All the stages of the study were followed by informed written consent and based on the latest version of the Helsinki Declaration.

The distribution of pain scores during the 24 evaluation steps is presented in figure 2.

As shown in figure 2, the results of the generalized estimation equation test demonstrate

a significant decrease in the pain index during the two medical treatments of acupuncture (B1) and clinical hypnosis (B2) ( $P < 0.05$ ).

The distribution of anxiety scores during the 24 evaluation steps is depicted in figure 3.

As shown in figure 3, the data analysis revealed a significant decrease in the anxiety index during the two medical treatments of acupuncture (B1) and clinical hypnosis (B2) ( $P < 0.05$ ).

The distribution of salivary cortisol level scores during the 24 evaluation steps is portrayed in figure 4.

As shown in figure 4, data analysis indicated a significant decrease in the anxiety index during the course of acupuncture treatment (B1) ( $P < 0.05$ ), while the changes in the clinical hypnosis stage (B2) were not significant ( $P = 0.93$ ).

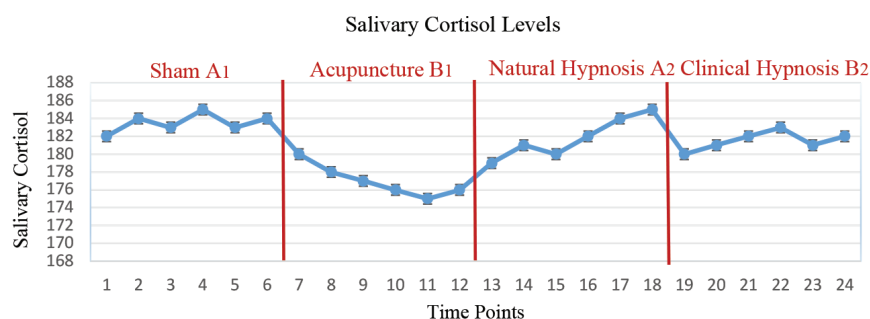
The results of correlation test with repeated measures showed that there was a significant positive correlation between pain index and anxiety and cortisol level.

( $\text{rrm}(1, \text{Cortisol-Pain}) = 0.79, 95\% \text{ CI } [0.86, 0.72], P < 0.01$ )

( $\text{rrm}(1, \text{Cortisol-Anxiety}) = 0.77, 95\% \text{ CI } [0.84, 0.71], P < 0.01$ )

## Discussion

This study was conducted aiming to compare the effectiveness of two acupuncture and clinical hypnosis treatments on pain index, anxiety, and cortisol levels in a child with burns. The results implied that hypnosis had a significant effect on the reduction of pain and anxiety and it did not have any effects on the salivary cortisol level. Additionally, acupuncture had a significant effect



**Figure 4.** Distribution of cortisol scores is portrayed during the 24 evaluation steps.



on the reduction of pain, anxiety, and cortisol level. The results also demonstrated that there was a significant positive relationship among pain and anxiety index and cortisol level. The difference between the two treatments was also of significance only on the effectiveness of acupuncture on salivary cortisol. Although comparing the effectiveness of the two treatments was a new issue not included in the research background, several studies have examined the effectiveness of each of the two treatments.

In line with the results of the present study, the results study of Pirnia and Pirnia<sup>5</sup> revealed that auricular acupuncture has a significant effect on pain relief in a patient with lobular cancer. In this regard, and in line with our findings, the results of the study by Pirnia et al.<sup>6</sup> showed that the use of auricular acupuncture was associated with a significant reduction in musculoskeletal pain in a patient with Trismus. Contrary to our results, the results of the study by Pirnia et al.<sup>7</sup> demonstrated that acupuncture did not have a significant effect on pain relief in patients with skeletal pain.

In line with the results of the present study, the results of the study by Pirnia et al.<sup>3</sup> implied that the use of acupuncture for four weeks was associated with a significant reduction of mood syndrome.

On the other hand, the research background support the therapeutic effectiveness of acupuncture on the reduction of the cortisol level.<sup>6</sup> In accordance with our findings, the research background indicates that acupuncture can reduce the level of salivary cortisol.<sup>3</sup>

A part of our results found that clinical hypnosis reduced pain and anxiety in the patient. Along with our results, the findings of Jafarzadeh et al.<sup>9</sup> illustrated that two sessions of hypnosis had a significant decline in pain and anxiety. The results of a meta-analysis by Provençal et al.<sup>8</sup> showed that using hypnosis is influential to pain relief and anxiety in burn patients.

We observed that hypnosis had no significant effect on the reduction of cortisol. There are few studies in this regard. Contrary to the findings of the present study, Chellew et al.<sup>10</sup> stated that

hypnosis was accompanied by a decrease in the cortisol levels. It seems that the process of the effectiveness of the hypnosis, due to its obscure nature, targets the subcortical pathway and biomarkers do not play a part in this process. However, this hypothesis requires conducting controlled clinical trials.

This study was accompanied by several limitations during the implementation process. Since the patient was eight years old and this age is within the maximum hypnosis range, generalization of the results to the adults may be biased. In this age range, natural hypnosis in the studied case may not have played a similar role to the placebo and have provided therapeutic self-efficacy itself. Finally, the use of corticotropin-based drugs can affect the perception of pain and anxiety, although the type of study involved minimized the bias of the findings. It is suggested that future studies compare the effectiveness of the two treatments in the form of a controlled clinical trial.

## Conclusion

The objective of the present work was to compare the effectiveness of two acupuncture treatments and clinical hypnosis on pain index, anxiety, and salivary cortisol levels in a child with burns. The results of this study, in line with the research background, indicated the effectiveness of each treatment on specific physical and psychological indices. These results could be considered in designing appropriate therapeutic programs although the explanation of the gap between the effectiveness of the two treatments requires further studies.

## Informed Consent

Informed consent was obtained from the patient's parents before any intervention.

## Conflict of Interest

None declared.

## References

1. Greaves M. COVID-19 and childhood acute lymphoblastic leukemia. *Pediatr Blood Cancer*.

- 2020;67(12):e28481. doi: 10.1002/pbc.28481.
2. Chester SJ, Stockton K, De Young A, Kipping B, Tyack Z, Griffin B, et al. Effectiveness of medical hypnosis for pain reduction and faster wound healing in pediatric acute burn injury: study protocol for a randomized controlled trial. *Trials*. 2016;17(1):223. doi: 10.1186/s13063-016-1346-9.
  3. Pirnia B, Pirnia K, Mohammadpour S, Malekanmehr P, Soleimani A, Mahmoodi Z, et al. The effectiveness of acupuncture on HPA functional in depressed patients under methadone maintenance treatment, a randomized double-blind sham-controlled trial. *Asian J Psychiatr*. 2018;36:62-3. doi: 10.1186/s13063-016-1346-9.
  4. Baker TE, Chang G. The use of auricular acupuncture in opioid use disorder: A systematic literature review. *Am J Addict*. 2016;25(8):592-602. doi: 10.1111/ajad.12453.
  5. Pirnia B, Pirnia K. Comparison of two mindfulness-based cognitive therapies and acupuncture on the pain and depression index in a case with lobular carcinoma: A single case experimental study. *Int J Cancer Manag*. 2018;11(6):e65641. doi: 10.5812/ijcm.65641.
  6. Pirnia B, Pirnia K, Zahiroddin A. Auricular acupuncture for craving in a single-subject case study of woman with fibromyalgia and chronic ecstasy use. *Iran J Public Health*. 2018; 47(7): 1055-7.
  7. Pirnia B, Nakhost HRT, Pirnia K, Moradi AR, Teimouri M. Ear acupuncture in treating trismus-syndrome: A case report. *Ann Med Health Sci Res*. 2017;7:97-8.
  8. Provençal S-C, Bond S, Rizkallah E, El-Baalbaki G. Hypnosis for burn wound care pain and anxiety: A systematic review and meta-analysis. *Burns*. 2018;44(8):1870-81. doi: 10.1016/j.burns.2018.04.017.
  9. Jafarizadeh H, Lotfi M, Ajoudani F, Kiani A, Alinejad V. Hypnosis for reduction of background pain and pain anxiety in men with burns: A blinded, randomised, placebo-controlled study. *Burns*. 2018;44(1):108-17. doi: 10.1016/j.burns.2017.06.001.
  10. Chellew K, Evans P, Fornes-Vives J, Pérez G, Garcia-Banda G. The effect of progressive muscle relaxation on daily cortisol secretion. *Stress*. 2015;18(5):538-44. doi: 10.3109/10253890.2015.1053454.